Benjamin G. Pierce

NSF Graduate Research Fellow at CWRU
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RESEARCH INTERESTS

Photovoltaics **Modeling** **Machine Learning** **Energy Systems** **High-Performance Computing**

EDUCATION

Case Western Reserve University
Jan 2024 –
PhD. Computer Science
Cleveland, OH

- Advisor: Prof. Orhan Ozguner

Case Western Reserve University
Aug 2017 – May 2021
B.S. Computer Science; GPA: 3.6
Cleveland, OH

EXPERIENCE

Sandia National Laboratories
October 2021 - June 2023
Member of the Technical Staff, R&D Systems Engineering
Albuquerque, NM

- Used sky images and novel sensors to forecast and nowcast cloud coverage and irradiance for SATs.
- Modeled PV performance for continental US for factors including terrain slope, shading, and degradation.
- Used Sandia High Performance Computing clusters to accelerate R&D for multiple projects.

Sandia National Laboratories
May 2020-October 2021, Sep 2023-Current
Student Intern
Albuquerque, NM

- Devised novel control algorithms for single axis trackers (SATs), resulted in submitted patent application and DOE funding.

Solar Durability and Lifetime Extension Center
Aug 2018 – May 2021
Research Assistant
Cleveland, OH

- Used image processing to find the rate of crystallization of AlN on a molten Al-Ni alloy.
- Utilized unsupervised machine learning to sort electroluminescence images based on defects and/or damage.
- Investigated electrical impact of cracks on Si PV cells.

PUBLICATIONS

- **B. G. Pierce**, M. R. Davidson, M. Theristis, and D. Riley, "Capacity Expansion for Utility Scale Single Axis Tracked PV Systems with Sub-Optimal Performance," in 2024 IEEE 52nd Photovoltaic Specialist Conference (PVSC), Jun. 2024, pp. 1310–1317 [Online]
- **B. G. Pierce** et al., "Comparison of Empirical and Data Driven Digital Twins for a PV+Battery Fleet," in 2024 IEEE 52nd Photovoltaic Specialist Conference (PVSC), Jun. 2024, pp. 1391–1397 [Online]
- R. Wieser, **B. G. Pierce**, et al., "PVplr-python: Python Package Implementation of PVplr for Performance Loss Rate Analysis," 2024 IEEE 52nd Photovoltaic Specialist Conference (PVSC), Seattle, WA, USA, 2024, pp. 1325-1327 [Online]

- M. Adachi, S. Hamaya, D. Morikawa, **B. G. Pierce**, A. M. Karimi, Y. Yamagata, K. Tsuda, R. H. French, H. Fukuyama, "Temperature dependence of crystal growth behavior of AlN on Ni-Al and demonstration of thick AlN film growth using electromagnetic levitation and computer vision technique" in Materials Science in Semiconductor Processing, 1/1/2023 [Online]
- **B. G. Pierce**, J. L. Braid, J. S. Stein, and D. Riley, "Cloud Segmentation and Motion Tracking in Sky Images," IEEE J. Photovoltaics, 10/17/2022, [Online]
- **B. G. Pierce**, J. L. Braid, J. S. Stein, J. Augustyn, and D. Riley, "Solar Transposition Modeling via Deep Neural Networks With Sky Images," IEEE J. Photovoltaics, 11/22/2021 [Online]
- C. M. Whitaker, **B. G. Pierce**, R. H. French, and J. L. Braid, "Properties of PV Cell Fractures and Effects on Performance of Al-BSF and PERC Modules," in IEEE 48th Photovoltaic Specialists Conference, 6/6/2021 [Online]
- **B. G. Pierce**, A. M. Karimi, J. Liu, R. H. French, and J. L. Braid, "Identifying Degradation Modes of Photovoltaic Modules Using Unsupervised Machine Learning on Electroluminescence Images," in 2020 47th IEEE Photovoltaic Specialists Conference, 6/15/2020 [Online]
- C. M. Whitaker, **B. G. Pierce**, A. M. Karimi, R. H. French, and J. L. Braid, "PV Cell Cracks and Impacts on Electrical Performance," in 47th IEEE Photovoltaic Specialists Conference, 6/15/2020 [Online]
- A. M. Karimi, J. S. Fada, N. A. Parrilla, **B. G. Pierce**, M. Koyutürk, R. H. French, and J. L. Braid. "Generalized and Mechanistic PV Module Performance Prediction from Computer Vision and Machine Learning on Electroluminescence Images," IEEE J. of Photovoltaics, 3/30/2020 [Online]

INTELLECTUAL PROPERTY

- J. Stein, J. L. Braid, **B. G. Pierce**, and D. Riley, "Systems and methods for single-axis tracking via sky imaging and machine leanring comprising a neural network to determine an angular position of a photovoltaic power system," US 11,823,409 B1, Nov. 21, 2023 [Online]

AWARDS & HONORS

NSF Graduate Research Fellow — National Science Foundation
Awarded presigious NSF GRFP fellowship for graduate school funding. — April 2023

IEEE PVSC 2022 Session Chair — IEEE PVSC
Co-chair for Solar Resource and PV Forecasting, Session II — June 2022

Computer and Data Sciences Research Award — CWRU
To the graduating senior demonstrating exceptional research potential — May 2021

Herbold Scholar — CWRU
Awarded funding for Master's program at CWRU, declined for full-time position at Sandia — May 2021

DOE Science Undergraduate Laboratory Internships (SULI) — Lawrence Berkeley National Lab
Offered SULI funding for Summer 2020, declined for Sandia internship — May 2020

TECHNOLOGIES

Programming Languages — Python, R, Julia, C, Java, bash
Libraries — PyTorch, TensorFlow, NumPy, sklearn, pandas, pvlib-python
Laboratory Equipment — Eternalsun Spire, electro/photoluminescence, SunsV_{oc}, breadboard electronics, etc.
Databases — Hadoop2/Hbase, MySQL, MS SQL Server, SQLite

Other High-performance computing, LaTeX

ACTIVITIES

Association for Computing Machinery Student Member, 2019
Institute of Electrical and Electronics Engineers Student Member, 2020
Study Abroad Cape Town, South Africa, Summer 2018
Volunteer Teaching Correspondent Prison Mathematics Project, Summer 2021-